

SpotLight

THE PEOPLE
WHO **DRIVE**
OUR SCIENCE
& TECHNOLOGY

MARCH 2022

LAWRENCE LIVERMORE NATIONAL LABORATORY

THE NEED FOR

SPEED

ALSO INSIDE:

- Making musical magic
- Driven to the gold
- Dragon aerodynamics





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& TECHNOLOGY

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INSIDE THIS ISSUE ● ● ●

It's been an adrenaline rush for **Dionne and Patrick Williams** for several years since the couple took up the sport of drag racing. Patrick runs a bracket car (truck), which is a 10.60 car (it can do 10.60 seconds in the ¼ mile), while Dionne serves as the crew chief, where she is responsible for ensuring the team members successfully complete their job before the vehicle ever leaves the pit.

4

If a tree could tell a story, **Robert Hartung** knows the ending in the form of a custom-made Fender Stratocaster. He fashioned the guitar from a felled apricot tree in his yard. When he was cutting it down, he thought building a guitar from the wood was worth a try, not to mention the tree has some sentimental value since his daughters used to climb it as kids.

8

A love for fitness, patience and perseverance aren't the only things that help **Lateef Arnold** stay focused while training for his upcoming bodybuilding competitions; the occasional cheeseburger on cheat days carries just as much weight. Arnold became hooked on the sport after attending his first bodybuilding show as a spectator, and he's come a long way since then.

14

Brian Gunney is telling his own fantasy stories with the recently published "Dragon's Ridge." His tale is set apart from many others because it takes cues from a series of charts explaining the takeoff speeds of various sizes of dragons, and a summary of the real-world historical location where the story takes place. Gunney uses writing as a release.

16

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We hope you enjoy this edition of *SpotLight*. We'd also like to hear from you. Send us your thoughts and suggestions, whether it's what you like — or even what you don't — about this magazine, or if there is something you would like to see in coming editions. You can reach us via email at pao@llnl.gov.

THEY ARE THE FAST & FURIOUS

Dionne and Patrick Williams keep with family tradition of drag racing

An adrenaline rush. That is how Dionne and Patrick Williams describe drag racing.

As Patrick waits for the green light, he knows what to expect. He knows he has to push his truck to its limits in a somewhat controlled chaotic environment.

"If your car doesn't scare you a little, then it isn't fast enough," Patrick said. "It seems the faster the car goes the more I enjoy the experience and when a weekend of adrenaline packed racing is complete I am completely exhausted. The adrenaline rush is addictive and it will drain you if you are not careful."

It has been an adrenaline rush for several years for the two Lawrence Livermore National Laboratory employees. The Williams couple works for the Weapons and Complex Integration Directorate, where Dionne is the administrator for the W87-1 Program and Patrick is the Superblock maintenance manager.



Patrick Williams gets his Chevy S10 ready for qualifying in the staging lanes in Las Vegas.

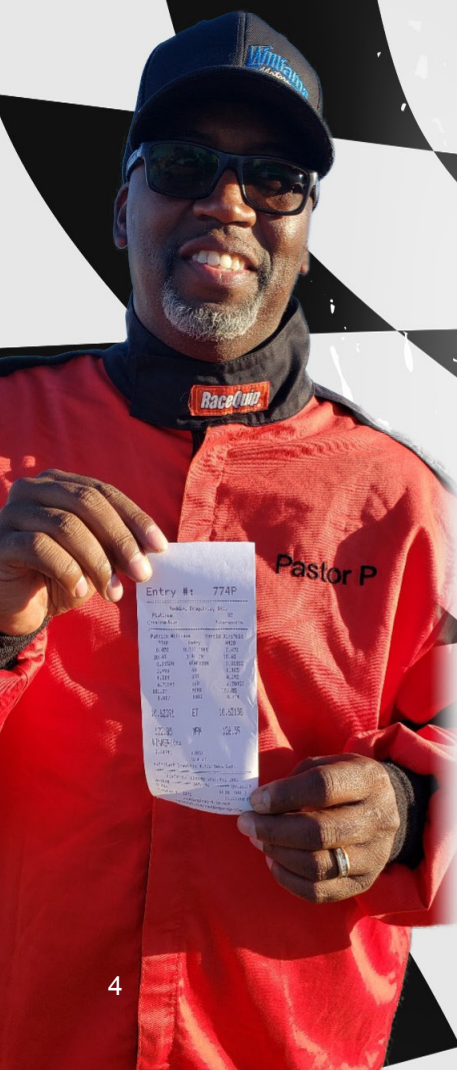
Patrick runs a bracket car (truck) called Lil' Red, which is a 10.60 car (it can do 10.60 seconds in the ¼ mile) and is one of the deadliest in the bracket world. He has won two first-, seven second- and one third-place trophies while racing with the West Coast Pro Gas Association.

While Patrick drives, Dionne serves as the crew chief, where she is responsible for ensuring the team members successfully complete their job before the vehicle ever leaves the pit.

Patrick and Dionne do bracket and grudge racing. Bracket racing involves dialing in a time for the vehicle and running that time consistently (i.e. 10.60 seconds in ¼ mile).

"This is tricky because you don't just race the other car," Patrick explained. "You also race the weather, including factors like barometric air pressure, density altitude, humidity, temperature, wind and other factors changing all the time."

Patrick Williams drives his friend's son's car after Patrick's motor blew up at the Las Vegas Speedway.



Patrick Williams proudly shows his winning time slip from a race in Redding, California.



Dionne said even from leaving the pit to the staging lanes and then to the starting line, the weather can change, and the racers need to be able to adjust to these changes quickly. It could be the difference between a win or a loss. “The weather plays a role in how much horsepower an engine will make at a given time,” she said.

Grudge is “run what you brung” and go as fast as you can from the starting line to the finish line. The first one to the finish line wins. This style of racing is normally “Outlaw Style,” meaning anything goes. Racers can use any power adder such as nitrous oxide, turbo, supercharger, methanol fuel, alcohol fuel, high-octane leaded fuel or a combination of it all.

Early to rise, early to win

“We arrive at the track early in the morning to set up the pit if we did not do it the night before,” Dionne said.

The two follow a checklist posted on their white board in the trailer that includes essential checks that must be done to ensure Lil' Red is ready for the track and that Patrick will be safe. Items on the list include prayer, setting the tire pressure needed for the current weather and track

conditions, verifying if more fuel is needed in the truck and checking the fuel pump pressure and oil levels. The list also includes making sure to empty overflow tanks, torquing all the lug nuts on the wheels, setting the Exact Dial Throttle Stop (EDTS) that restricts the air flow to the truck’s engine to slow it down (used in bracket racing to dial in 10.60 seconds every run). Currently, Patrick has a pending patent on the design of the EDTS.

Dionne guides the seven-member race team. Each team member has a specific duty that they are responsible for. As crew chief, Dionne also has several more key positions, one of which is making sure the safety checklist on the trailer door is completed before each run and checking the tire pressure right before the truck goes into the starting line.

Once she straps Patrick into the truck, she goes to the side of the track and directs Patrick’s burnout in the burnout box. She directs the burnout to ensure he reaches optimum heat in the big rear slicks for proper traction at launch. Lastly, she takes all of the time slip data after a run and enters it into the computer database along with the weather conditions for each run.

Patrick uses the historical time slip and weather data to develop the tune up for the next run with the goal to run the exact same E.T. (estimated time) of 10.60.

On a typical race day, Patrick gets at least two qualifying runs for each class he is competing in. After the qualifying runs, he goes into eliminations. If he is winning during the eliminations, he keeps going until the final two cars are left. Then a race will occur for the championship of that race and the runner up.

A family tradition

The Williams family has been in the racing, automotive and car audio field for more than 60 years.

Patrick’s father Ralph Williams inspired him to race. The patriarch introduced this passion to his three sons, Patrick, Ralphell and Reggie, and passed on all of his knowledge of building cars and engines to them. Ralph was a legend in the Texas streets for his streetcars and his performance at Yello Belly Drag Strip in Dallas and at Cedar Creek Dragway in Henderson County.

Patrick’s first drag racing car was a 1965 Malibu Chevelle, which he raced at Yello Belly Drag Strip and in the streets of Dallas.

Now, Patrick owns and runs Williams Motorsports, which is based in Northern California. He also owns a racing team called “At The Cross Drag Racing,” which is a Christian-based race team.

“Drag racing is fun if all you want to do is a burnout and go down the track, have a barbecue in the pits with your friends and have wonderful stories to tell your co-workers at work on Monday. The fun is harder to experience when you want to win.”

– Patrick Williams

“Williams Motorsports is a place where racers help racers,” Dionne said. “Patrick’s expertise is providing custom solutions for challenging projects. Patrick is a visionary when developing new concepts and provides world-class customer service to every client.”

Patrick’s philosophy about drag racing is to remember it is all about having fun.



At left: Patrick Williams puts the pedal to the metal during one of his competitions.

Foreground: Patrick and Dionne Williams showcase drag racing memorabilia and trophies.



Axe man

ROBERT HARTUNG'S
CUSTOM-MADE GUITARS
MAKE MUSICAL MAGIC

By Jeremy Thomas

In the 1984 film “The Natural,” a baseball player named Roy Hobbs, played by Robert Redford, carves a bat from a tree outside his childhood home after it is struck by lightning. Because of the tree’s sentimental value (and perhaps a little mojo), the “Wonderboy” takes on a mythical significance, helping Hobbs become a powerful big-league hitter.

While it hasn’t quite bestowed guitar god-like powers on Robert Hartung, his custom Fender Stratocaster, which he fashioned himself from a felled apricot tree, is “magical” in its own right, according to its creator. Starting the project in 2017, Hartung spent the next three years building the unique guitar from scratch, cutting, shaping and routing the wood, gluing the pieces together, installing wiring and electronic components and applying the finishing touches to replicate the iconic Strat.



Though he doesn’t consider himself a woodworker, Hartung is no stranger to tools and enjoys the challenge of trying something new. In addition to his two handmade electric guitars, he’s modified many others over the last 40 years, a hobby he credits to his penchant for tinkering and getting “bored easily.”

“In a weird way, it seemed inconceivable and like such a crapshoot,” Hartung said. “When I was cutting it down, I thought ‘it’s worth a try; why not?’ It’s gorgeous wood. At worst case it’s firewood, but maybe I can turn it into something. This also was a tree my daughters would climb in as kids, so it has some lineage to the house. There’s history to it, too.”

After “completing” the apricot guitar (Hartung is constantly tweaking it) he pursued another custom axe, a Telecaster clone birthed from vintage barn wood. Building guitars has become an escape from the COVID-19 pandemic for Hartung, whose day job is as the Lab’s associate program leader for Hardware & Field Support in LivIT.

Owing to his IT roots, Hartung says he “gets bored easily” and enjoys a good challenge, counting beekeeping, craft beer-making, photography and gardening among his many hobbies.

“I like to figure things out and try to fix them,” Hartung said. “The stuff I do now I call my analog hobbies, where I can get away from the computer and get more into older things, and that’s where the guitar making comes in.”

The origin story of Hartung’s foray dates back to the early 1980s. Inspired by his guitarist-idol Eddie Van Halen’s penchant for building his own guitars — his best known creation being the “Frankenstrat” he piecemealed from various Gibson and Fender parts — Hartung set out to modify his first electric guitar, an inexpensive Stratocaster that didn’t suit his tastes.

Building guitars has become an escape from the COVID-19 pandemic for Robert Hartung. After spending almost three years fashioning an apricot wood Fender Stratocaster (left) clone from a felled tree, Hartung built another from scratch, a custom “Nashville” Telecaster (at right and above) he built from vintage barn wood.



“When I started splitting it, I saw that the grains were just gorgeous. It’s not something you can buy in a lumber yard. Right away I thought, ‘I wonder if I can do something with this?’”

— Robert Hartung

The son of a toolmaker, Hartung was no stranger to the machine shop. Blessed with an affinity for taking things apart and figuring out how they worked, Hartung dissected the unsatisfactory Strat, rewiring it and upgrading and replacing components. Over the years, the guitar became unrecognizable, as Hartung gradually replaced its bridge, neck and finally, the entire body.

“When you get frustrated with the instrument, you hit a tipping point; you either sell it to get something else that you prefer, or you open it up and start exploring more,” Hartung explained. “The mentality was, ‘well, it’s not really going to damage anything, so why not try it out?’ I made some mistakes along the way, but those are the stepping stones to getting to what you want.”

Hartung earned a reputation for tinkering with guitars to get the perfect feel and sound, which he leveraged into a short-lived stint as a roadie for a Los Angeles band. Over the next 40 years, he would modify, upgrade and fix many guitars, but had never built one from the ground up.

That changed one day, when, at the same time his Strat began splitting, the rotting apricot tree in his backyard needed to come down. Though Hartung didn’t consider himself a woodworker, he was struck with the beauty of the wood and felt compelled to preserve it.

“When I started splitting it, I saw that the grains were just gorgeous,” Hartung said. “It’s not something you can buy in a lumber yard. Right away I thought, ‘I wonder if I can do something with this?’”

Hartung saved the trunk, chopped it into pieces and dried it out for a year. Satisfied it was ready, he took the wood to a friend in Los Angeles who owned specialized woodworking equipment. Armed with Leo Fender’s Stratocaster blueprints and Hartung’s old Strat — which he penciled around to get the new guitar’s basic shape — the two men milled it into sections. Back home in Walnut Creek, Hartung glued them into place and routed the body by hand, carving areas for the neck pocket, pickups, bridge and tremolo.

“Apricot wood is really hard wood,” Hartung explained. “It’s really rare that it’s used much in woodworking — it’s usually for small decorative pieces. There were three times I was certain I would quit and couldn’t go any further. Each step of the way I’d have to set it aside because I’d hit these frustration points.”

Hartung realized he hadn’t dried the wood long enough; it began cracking, and the width of the body shrunk. It also

exhibited “spalting,” a coloration caused by fungi. Mashing together wood glue and dust left over from sanding, Hartung filled the cracks, like using gold to repair cracks in porcelain teacups.

“Wherever I ran into a problem, I would just reverse that and say, ‘that’s ok, you meant to do that,’” Hartung said. “It helped to work through it.”

Hartung completed the routing and put the finishing touches on the body by brushing on layers of lacquer, sanding it between coats and adding a satin finish. Then came the assembly; Hartung repurposed his old Stratocaster’s neck, added the tremolo, tuning heads and pickups he’d purchased online and wired the pickups to the volume and tone knobs, modeling the electronics after legendary blues guitarist Stevie Ray Vaughan.

Hartung completed the basic guitar in July 2019, but it continues to evolve. He recently swapped in Pure Vintage ‘59 Fender pickups and completely rewired it, looking for the perfect sound. It’s now his go-to instrument for “noodling around.”

“I love how it turned out,” Hartung said. “It’s probably one of the heaviest guitars I’ve ever had, maybe next to a (Gibson) Les Paul. I’m just super proud of it.”

Shortly after finishing the apricot guitar, a neighbor of Hartung’s work manager offered Hartung a beam of wood from a barn located on his property. Hartung liked the prospects of turning it into another distinctive electric guitar but was unsure how to approach it.

After about a year, he took the 4-by-6-foot beam to his table saw, cutting it down the center. Calculating it to be too short for another Strat, this time he decided to recreate Fender’s smaller-bodied Telecaster.

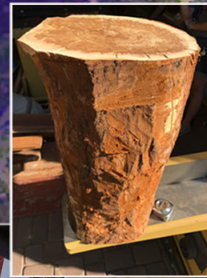
“I looked for something unique and something that would be fun to do,” Hartung said. “It wasn’t a body style that I’ve used in the past, so it was a good opportunity to build something new to play that feels different.”

Hartung’s second project went more smoothly than the first, taking only about a month from start to finish. Once again, he brought the wood to his friend in LA to mill it, completed it in a day and brought the pieces back home. Starting with a template he ordered online, he shaped it by hand. He glued the pieces and routed it out in one weekend, applying several layers of lacquer. The wood had wormholes and cavities, so Hartung purchased dental



For his custom barn wood guitar, Hartung accentuated the wood’s natural wormholes to give it a rustic look and “dove into the electronics,” basing them on a Nashville Telecaster style popular with country musicians. He added a third pickup between the neck and bridge pickups to produce a rockabilly sound and enjoys the guitar’s versatility of sounds.

Step 1: Work begins with the trunk of apricot wood cut from a rotting tree.



Step 2: The wood is milled into sections and pieces glued together.



Step 3: The outline for the guitar's body is drawn and cut with a band saw.



Step 4: The guitar's body is formed with help from a belt sander.



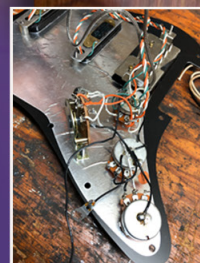
Step 5: Holes are drilled for areas for the neck pocket, pickups, bridge and tremolo prior to routing.



Step 6: The body contours are added and sanded.



Step 8: The body is lacquered multiple times, with sanding between layers.



Step 9: The guitar's pickups and electronics are soldered together.



Step 10: The guitar is assembled.

Ax to Axe

instruments to clean them out. Instead of covering them up however, he accentuated them.

Aside from aesthetics, Hartung sought a configuration he'd never seen before, based off the Nashville Telecaster style, which adds a third pickup in between the neck and bridge pickups of a standard Telecaster. After finishing the body and adding an inexpensive neck, Hartung "dove into the electronics." In addition to a Stratocaster neck pickup and the twangy Telecaster bridge pickup popular with country musicians, Hartung installed a Gretsch humbucker pickup in the middle, giving the guitar a 1950s rock & roll/rockabilly sound a la The Brian Setzer Orchestra or Duane Eddy.

While lessons learned from his first project eased the process, Hartung acknowledges a few mistakes during the build. And since mixing and matching pickups can disturb their magnetic polarity — resulting in hums and other sound issues — the electronics proved "way more challenging" the second time around.

"This was definitely a new stage for me and a huge hurdle," Hartung said. "Thank God for the Internet, because what I was doing, I hadn't seen anyone do before."

The experiment led Hartung to create an entirely new wiring diagram, which he uploaded on an internet forum for others who might pursue the same setup. Now, with all three pickups geared to his liking, Hartung says he's happy with its "grittier" sound, antique appearance and versatility.

"It's kind of a session musician's guitar," Hartung explained. "You can play blues with the neck pickup easily, or you can play rockabilly with the middle pickup and with the bridge pickup you can play country. It's an interesting instrument because there's so much flexibility of styles."

As pleasing visually as they are enjoyable to play, Hartung said he's beseeched by his guitar-playing friends and others asking to jam on them. Modest about his own chops, Hartung does sit in on the occasional band (most recently for a work holiday party) and practices nearly every day on his handmade guitars. He switches back and forth between them as the mood strikes, along with a factory stock (and more expensive) Stratocaster he recently acquired and never modified. While he loves them all, he's "still giddy" about the apricot guitar.

"Every time I pick it up, that's my baby now," Hartung said. "This is the one that sits there in my living room, and that's what I grab. It's fun to play, it sounds phenomenal. I want people to play it. I'm just super proud of it."

In addition to being conversation pieces, Hartung said the guitars also have encouraged him to further his improvisation and expanded his musical horizons.

"You can pick up the same guitar every day and get into a rut," he explained. "Then someone hands you another guitar and somehow, something different comes out. I've

"I liked the idea of it having a rustic look, so if you didn't know it had been built (today) you'd think it'd been sitting around getting chewed on for a long time. I wanted it to look beat up. I didn't smooth it out much, I felt like that would make it look weathered and Western."

— Robert Hartung

done that on steroids with this new (barn wood) one. I've put new pickups in it and completely different hardware, so you're forced to approach it differently. Out of that, you can be creative in a whole different way."

Hartung said he has "at least one guitar body project left" in him and is already thinking about his next one, possibly crafted from black walnut. Always up for a challenge, Hartung would like to learn how to carve a curve. Additionally, the two he's already built continue to keep him busy. He admits they're "probably never done."

"There's always something else to tweak or adjust, just like I've been doing for the last 40 years," Hartung said. "But they're pretty much the way I want them, until I want to change them. They're perfect until they're not."

Besides their utility as instruments, to Hartung the guitars are an expression of his artistic side, representing the mistakes he made and how he overcame them to create "works of art" he can pass along to his two daughters as family heirlooms.

"I'm really proud of having done them, because it's not something that right up front was obvious that I could do," Hartung said. "I've never considered myself to be an artist. This was an opportunity for me to interpret that piece of wood, figure out how to approach it and use things that aren't traditionally considered art tools. They can continue to create and that's uniquely different than paint on a canvas. I just love what they became."

Patience, perseverance and an occasional cheeseburger drive Lateef Arnold to the

GOLD

By Michael Padilla

Arnold displays his four trophies he earned at NPC Missouri State Championships.



The love for fitness and the ability to sneak in a milkshake on cheat days helps Lateef Arnold stay focused while training for his upcoming bodybuilding competitions.

Arnold, master scheduler on the W87-1 Project Controls Team at Lawrence Livermore National Laboratory, became hooked on the sport after attending his first bodybuilding show as a spectator.

Arnold worked out with a couple competitors at his local gym and learned about the sport through the trainers there.

"My love for fitness got me into bodybuilding," Arnold said. "At first glance it seemed easy, you work out, pose and that's it. I had no clue what I was in for."

Arnold took part in his first competition in 2020. He won four trophies, two first place and two overall, in the men's physique division. He then qualified for nationals to compete the following season for a pro card but further training was put on hold due to the pandemic. He intends to compete again this year, requalify for nationals and work toward obtaining his pro card in coming years.

Motivation is a key factor in Arnold's passion for bodybuilding. His love for human anatomy and how muscle groups are engaged and interconnected helped spark his interest and desire to compete.

"I have a competitive mentality," he said. "My coach said it best, 'you don't have to work out or follow the meal plans we give you, just as long as you're okay with not coming in first.'"

"The sense of pride and confidence I feel when I look back at where I started in comparison to now," he said. "The crazy thing about bodybuilding is that you train all year to only compete on stage for a couple hours."

Patience has been key from his early days of training to compete. "As much as we want it to, the body does not change overnight," he said.

His advice for those who want to start weight training or competing as a bodybuilder is to go into it with an open mind and find a coach/community that can provide sound advice and guidance.

"A lot can be learned about yourself through the process, and you may uncover new traits and qualities you never knew you had," he said. "The habits of consistency, persistence and discipline are easily transferable to all aspects of life."

One side obstacle that he is learning to overcome is shopping for clothes. He always finds himself in between sizes as he is bulking up or leaning out for a show.

"For some of us who aren't the best chefs, meal prepping is another challenge, but the saving grace are meal prep companies that create meals to meet your dietary needs," he said.

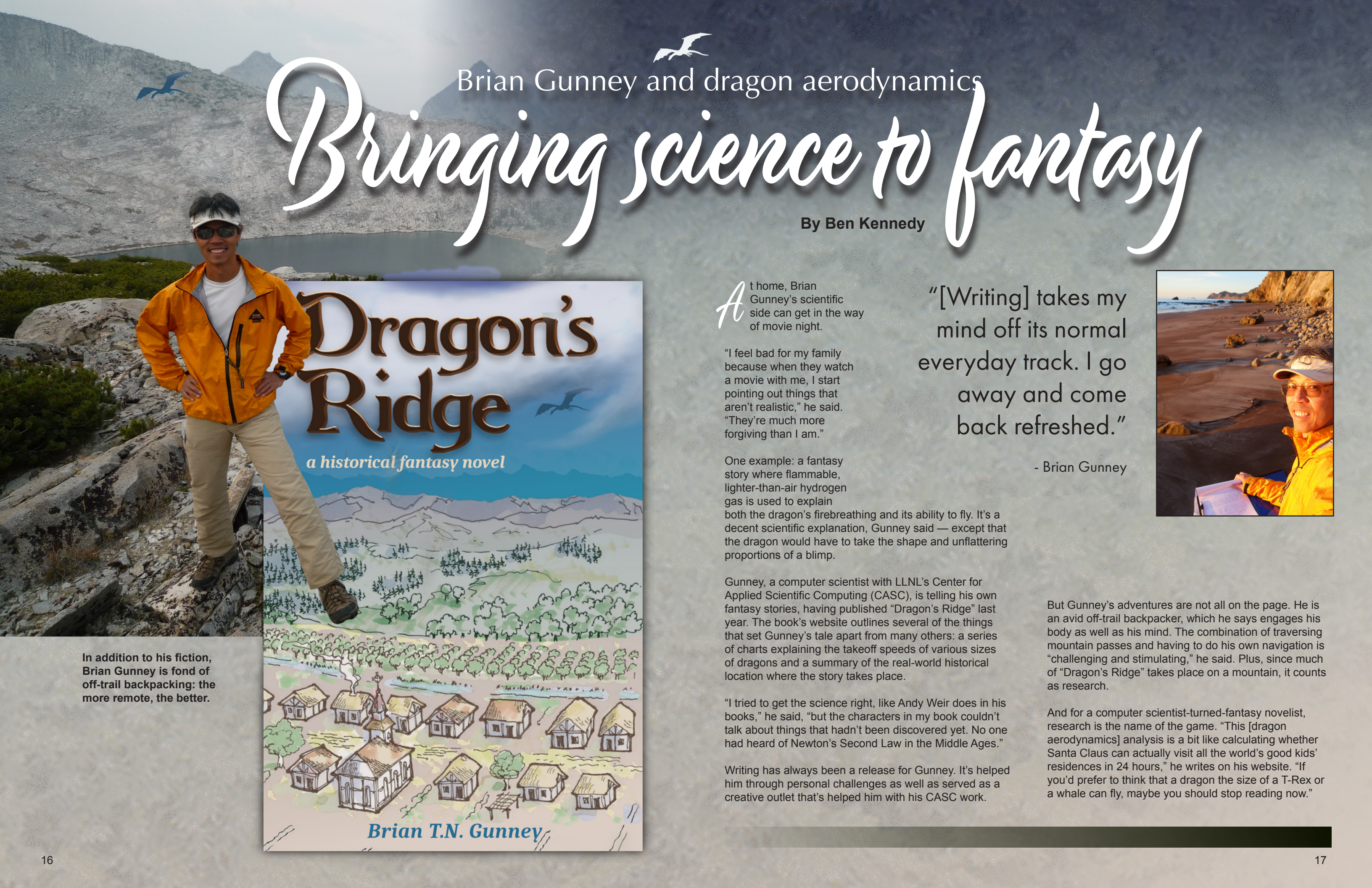
Managing relationships with friends and family can often times be difficult for him as well. "Saying no to going out with friends or bringing Tupperware to family gatherings because you have to stay on track with your eating regimen can be a challenge," Arnold added.

Diet and nutrition also play an integral role in developing a good physique. The time spent working out accounts for one to two hours max; the rest is being disciplined to stay on track with eating the right foods and drinking enough water to stay hydrated (muscle is 79 percent water).

"I get one cheat meal a week and my guilty pleasure is In-N-Out, this consists of two double cheeseburgers, fries," he said. "And of course, a strawberry milkshake."

Determination, motivation, the ability to say no to instant gratification and having a support group of family, coaches and friends help Arnold stay focused while training for a competition.





Brian Gunney and dragon aerodynamics

Bringing science to fantasy

By Ben Kennedy

At home, Brian Gunney's scientific side can get in the way of movie night.

"I feel bad for my family because when they watch a movie with me, I start pointing out things that aren't realistic," he said. "They're much more forgiving than I am."

One example: a fantasy story where flammable, lighter-than-air hydrogen gas is used to explain both the dragon's firebreathing and its ability to fly. It's a decent scientific explanation, Gunney said — except that the dragon would have to take the shape and unflattering proportions of a blimp.

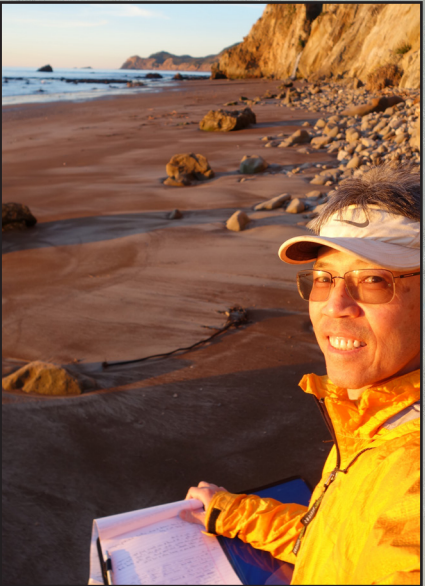
Gunney, a computer scientist with LLNL's Center for Applied Scientific Computing (CASC), is telling his own fantasy stories, having published "Dragon's Ridge" last year. The book's website outlines several of the things that set Gunney's tale apart from many others: a series of charts explaining the takeoff speeds of various sizes of dragons and a summary of the real-world historical location where the story takes place.

"I tried to get the science right, like Andy Weir does in his books," he said, "but the characters in my book couldn't talk about things that hadn't been discovered yet. No one had heard of Newton's Second Law in the Middle Ages."

Writing has always been a release for Gunney. It's helped him through personal challenges as well as served as a creative outlet that's helped him with his CASC work.

"[Writing] takes my mind off its normal everyday track. I go away and come back refreshed."

- Brian Gunney



But Gunney's adventures are not all on the page. He is an avid off-trail backpacker, which he says engages his body as well as his mind. The combination of traversing mountain passes and having to do his own navigation is "challenging and stimulating," he said. Plus, since much of "Dragon's Ridge" takes place on a mountain, it counts as research.

And for a computer scientist-turned-fantasy novelist, research is the name of the game. "This [dragon aerodynamics] analysis is a bit like calculating whether Santa Claus can actually visit all the world's good kids' residences in 24 hours," he writes on his website. "If you'd prefer to think that a dragon the size of a T-Rex or a whale can fly, maybe you should stop reading now."

In addition to his fiction, Brian Gunney is fond of off-trail backpacking: the more remote, the better.

Brian T.N. Gunney

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